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Dielectric Relaxation of Hydration Water in Native Collagen Fibrils

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Abstract

© 2017 American Chemical Society. The dielectric relaxation of hydrated collagen powders was studied over a wide temperature and frequency range. We revealed two mechanisms of dielectric relaxation in hydration water that are driven by the migration of ionic and orientation defects. At high water fractions in powders (h > 0.2), the hydration shell around the collagen triple helixes presents a spatial H-bonded network consisting of structural water bridges and cleft water channels. These two water phases provide the long-range paths for proton hopping and orientation defect migration. At low water fractions (h < 0.2) and in the hydrated collagen samples after the dehydrothermal treatment, the hydration shell presents localized individual water compartments not connected to one another. In these cases, the relaxation mechanism due to proton hopping either disappears or becomes inhibited by the orientation defect migration.

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